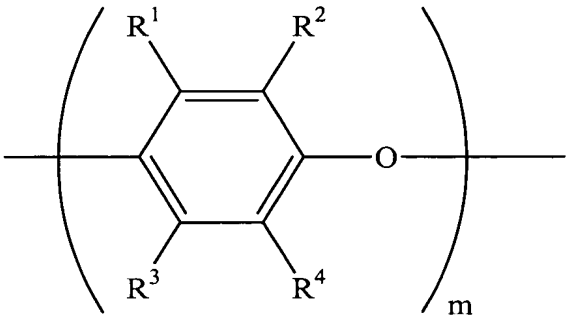
CLAIMS:

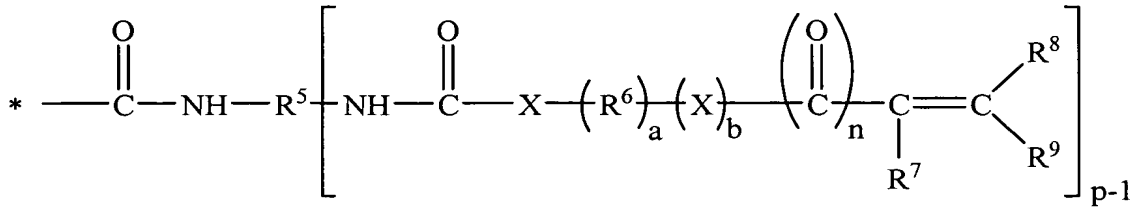
1. A functionalized poly(arylene ether) having the formula

$$Q(J\text{-}K)_y$$

wherein Q is the residuum of a monohydric, dihydric, or polyhydric phenol; y is 1 to about 100; J comprises repeating structural units having the formula



wherein R^1 and R^3 are each independently selected from hydrogen, halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; R^2 and R^4 are each independently selected from halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; each occurrence of m is independently 1 to about 200; and K is a capping group having the formula



wherein each occurrence of R^5 and R^6 is independently C_1-C_{18} hydrocarbylene, optionally substituted with heteroatoms; each occurrence of R^7-R^9 is independently

hydrogen or C_1-C_{18} hydrocarbyl; each occurrence of a is independently 0 or 1; each occurrence of b is independently 0 or 1; each occurrence of n is independently 0 or 1; each occurrence of X is independently –NH-, -O-, or –S-; and p is 2 to about 10.

2. The functionalized poly(arylene ether) of claim 1, wherein Q is the residuum of a monohydric phenol and y is 1.

3. The functionalized poly(arylene ether) of claim 1, wherein Q is the residuum of a dihydric phenol and y is 2.

4. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of R^1 and R^3 is independently hydrogen or C_1-C_{12} alkyl and each occurrence of R^2 and R^4 is independently C_1-C_{12} alkyl.

5. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of R^1 and R^3 is independently hydrogen or methyl and each occurrence of R^2 and R^4 is methyl.

6. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of R^5 is C_6-C_{18} arylene.

7. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of R^5 is independently 1,4-phenylene or 1,3-phenylene.

8. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of X is oxygen.

9. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of R^6 is independently C_1-C_{12} alkylene or C_6-C_{18} arylene.

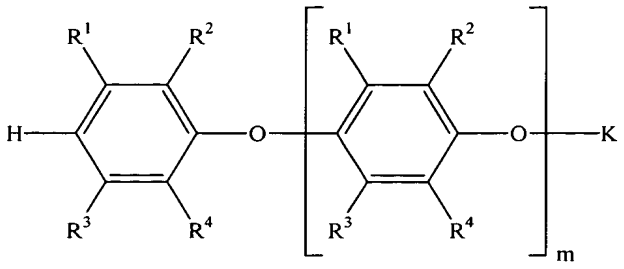
10. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of R^6 is dimethylene or trimethylene.

11. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of n is 0.

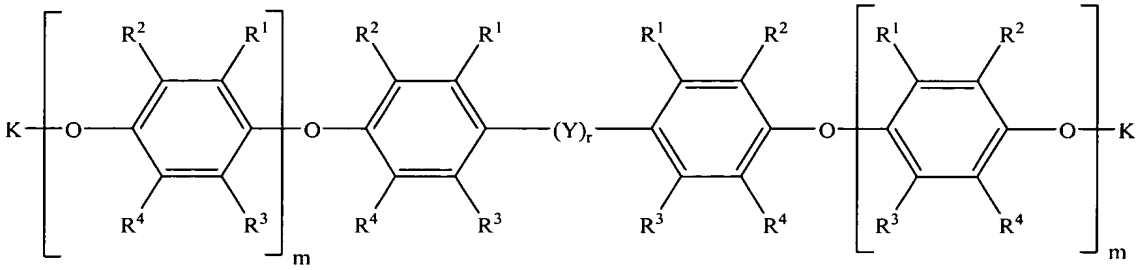
12. The functionalized poly(arylene ether) of claim 1, wherein each occurrence of n is 1, each occurrence of R^7 is independently hydrogen or methyl, and each occurrence of R^8 and R^9 is hydrogen.

13. The functionalized poly(arylene ether) of claim 1, having an intrinsic viscosity of about 0.05 to about 1 deciliter per gram measured at 25°C in chloroform.

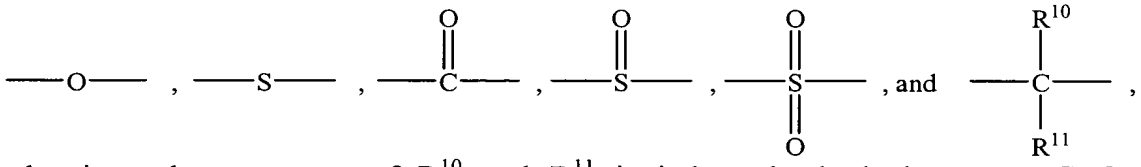
14. A functionalized poly(arylene ether) having the formula



, or



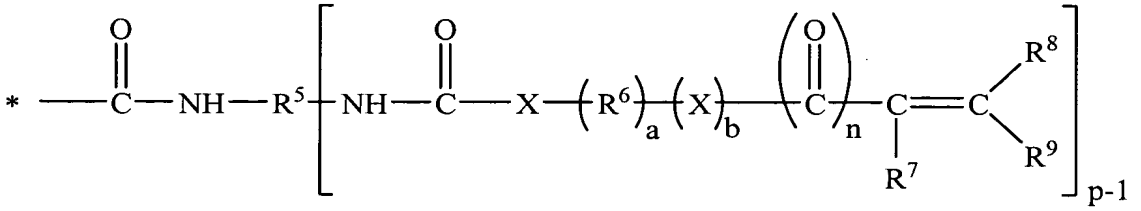
wherein each occurrence of R^1 and R^3 is independently hydrogen or methyl; each occurrence of R^2 and R^4 is methyl; each occurrence of m is independently 1 to about 200; r is 0 or 1; Y is a divalent group selected from



, and

,

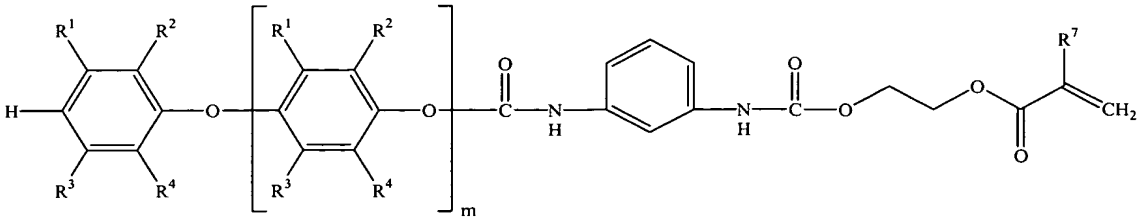
wherein each occurrence of R^{10} and R^{11} is independently hydrogen or C_1-C_{12} hydrocarbyl; and K is a capping group having the formula



wherein each occurrence of R^5 and R^6 is independently C_1-C_{18} hydrocarbylene, optionally substituted with heteroatoms; each occurrence of R^7-R^9 is independently hydrogen or C_1-C_{18} hydrocarbyl; each occurrence of a is independently 0 or 1; each

occurrence of b is independently 0 or 1; each occurrence of n is independently 0 or 1; each occurrence of X is independently –NH-, -O-, or –S-; and p is 2 to about 10.

15. A functionalized poly(arylene ether) having the formula

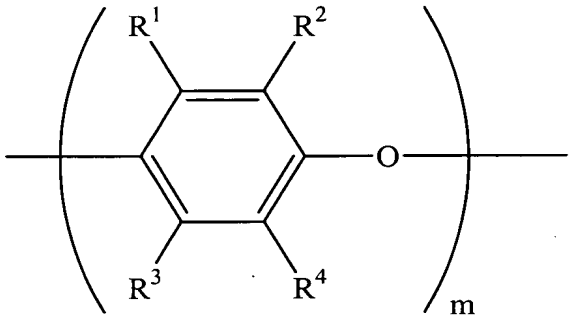


wherein each occurrence of R^1 and R^3 is independently hydrogen or methyl, each occurrence of R^2 and R^4 is methyl; R^7 is hydrogen or methyl; and m is 1 to about 200.

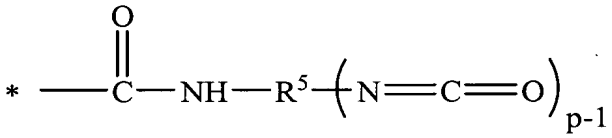
16. A functionalized poly(arylene ether) having the formula

$$Q(J\text{-}L)_y$$

wherein Q is the residuum of a monohydric, dihydric, or polyhydric phenol; y is 1 to about 100; J comprises repeating structural units having the formula



wherein R^1 and R^3 are each independently selected from hydrogen, halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; R^2 and R^4 are each independently selected from halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; each occurrence of m is independently 1 to about 200; and L is a capping group having the formula



wherein each occurrence of R^5 is independently C_1-C_{18} hydrocarbylene, optionally substituted with heteroatoms; and p is 2 to about 10.

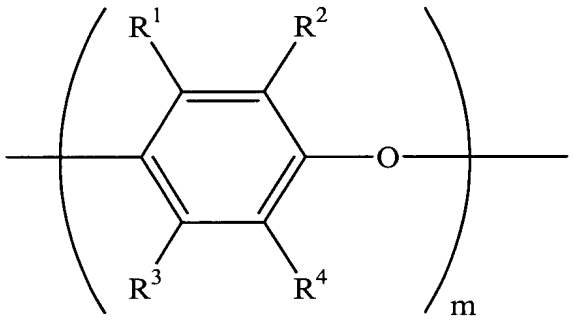
17. A curable composition, comprising:

an olefinically unsaturated monomer; and

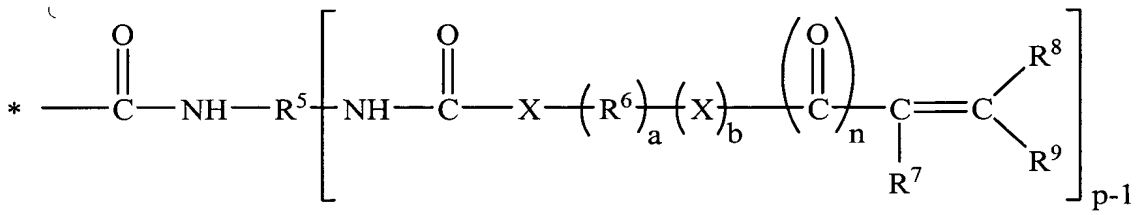
a functionalized poly(arylene ether) of the formula

$$Q(J\text{-}K)_y$$

wherein Q is the residuum of a monohydric, dihydric, or polyhydric phenol; y is 1 to about 100; J comprises repeating structural units and has the formula



wherein R^1 and R^3 are each independently selected from hydrogen, halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; R^2 and R^4 are each independently selected from halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; m is 1 to about 200; and K is a capping group having the formula



wherein each occurrence of R^5 and R^6 is independently C_1-C_{18} hydrocarbylene, optionally substituted with heteroatoms; each occurrence of R^7-R^9 is independently hydrogen or C_1-C_{18} hydrocarbyl; each occurrence of a is independently 0 or 1; each occurrence of b is independently 0 or 1; each occurrence of n is independently 0 or 1; each occurrence of X is independently –NH-, -O-, or –S-; and p is 2 to about 10.

18. The curable composition of claim 17, wherein the olefinically unsaturated monomer is selected from alkenyl aromatic monomers, allylic monomers, acryloyl monomers, vinyl ethers, maleimides, and mixtures thereof.

19. The curable composition of claim 17, further comprising a curing initiator.

20. The curable composition of claim 17, further comprising a curing inhibitor.

21. The curable composition of claim 17, further comprising a filler.

22. A cured composition, comprising the reaction products obtained by curing the curable composition of claim 17.

23. A process for preparing a functionalized poly(arylene ether) having a pendant carbon-carbon double bond, comprising:

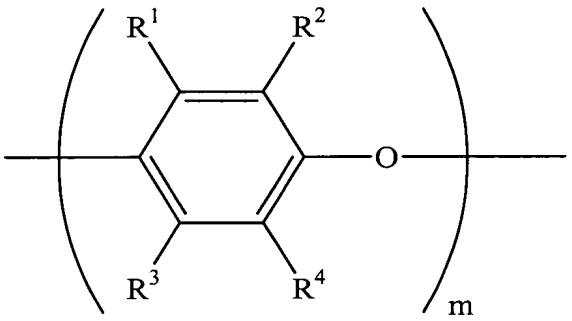
reacting a poly(arylene ether) with a polyisocyanate compound to form a urethane-capped poly(arylene ether) having pendant isocyanate functionality; and

reacting the urethane-capped poly(arylene ether) having pendant isocyanate functionality with a polyfunctional compound comprising (a) a carbon-carbon double bond, and (b) a hydroxy, thiol, or amino group to form the capped poly(arylene ether) having a pendant carbon-carbon double bond.

24. The method of claim 23, wherein the poly(arylene ether) has the structure

$$Q(J\text{-}H)_y$$

wherein Q is the residuum of a monohydric, dihydric, or polyhydric phenol; H is a hydrogen atom; y is 1 to about 100; J comprises repeating structural units and has the formula



wherein R^1 and R^3 are each independently selected from hydrogen, halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; R^2 and R^4 are each independently selected from halogen, primary or secondary C_1-C_{12} alkyl, C_2-C_{12} alkenyl, C_2-C_{12} alkynyl, C_1-C_{12} aminoalkyl, C_1-C_{12} hydroxyalkyl, phenyl, C_1-C_{12} haloalkyl, C_1-C_{12} hydrocarbyloxy, and C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each occurrence of m is independently 1 to about 200.

25. The method of claim 23, wherein y is 1 or 2, wherein R^1 and R^3 are each independently hydrogen or methyl, and wherein R^2 and R^4 are each methyl.

26. The method of claim 23, wherein y is 1, wherein R^1 and R^3 are each hydrogen, and wherein R^2 and R^4 are each methyl.

27. The method of claim 23, wherein the polyisocyanate compound has the structure

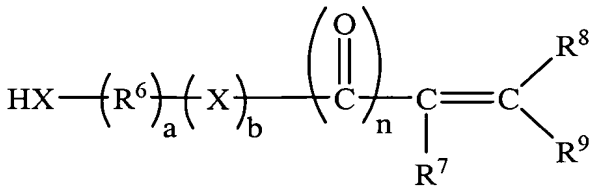
$$R^5(NCO)_p$$

wherein p is 2 to about 10; and R^5 is a polyvalent hydrocarbon radical having a valence equal to p, optionally substituted with heteroatoms.

28. The method of claim 23, wherein the polyisocyanate compound comprises a diisocyanate, a triisocyanate, a tetraisocyanate, or a mixture thereof.

29. The method of claim 23, wherein the polyisocyanate compound is selected from isophorone diisocyanate, tetramethylxylene diisocyanate, toluene diisocyanate, diphenylmethylene diisocyanate, methylene dicyclohexane diisocyanate, 2,2,4-trimethyl hexamethylene diisocyanate, m-phenylene diisocyanate, 4-chloro-1,3-phenylene diisocyanate, 4,4'-biphenylene diisocyanate, 1,5-naphthylene diisocyanate, 1,4-tetramethylene diisocyanate, 1,6-hexamethylene diisocyanate, 1,10-decamethylene diisocyanate, 1,4-cyclohexylene diisocyanate, polyalkyleneoxide diisocyanates, polyester glycol diisocyanates, 2,4,6-toluene triisocyanate, triphenyldimethylene triisocyanate, 4,4',4"-triphenylmethylene triisocyanate, 4,4'-dimethyl-diphenylmethane-2,2',5,5'-tetraisocyanate, tetraphenyltrimethylene tetraisocyanate, pentaphenyltetramethylene pentaisocyanate, and mixtures thereof.

30. The method of claim 23, wherein the polyfunctional compound has the structure



wherein each occurrence of X is –NH-, -O-, or –S-; R^6 is C_1-C_{18} hydrocarbylene, optionally substituted with heteroatoms; R^7, R^8, and R^9 are independently hydrogen or C_1-C_{18} hydrocarbyl; a is 0 or 1; b is 0 or 1; and n is 0 or 1.

31. The method of claim 23, wherein the polyfunctional compound is selected from vinyl alcohol, 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, hydroxymethyl (meth)acrylate, N-hydroxymethyl (meth)acrylamide, polyethylene glycol (meth)acrylate, polypropylene glycol (meth)acrylate, hydroxystyrenes, hydroxymethylstyrenes, carboxystyrenes, hydroxyethyl vinyl ether, (meth)acrylic acid, and mixtures thereof.

32. The method of claim 23, wherein said reacting a poly(arylene ether) with a polyisocyanate compound and/or said reacting the urethane-capped poly(arylene ether) having pendant isocyanate functionality with a polyfunctional compound is conducted in the presence of a catalyst.